

to be of the greatest interest and value. M. Blaringhem's account of his experiments forms a stimulating starting-point to such an inquiry, and should be read by everyone engaged in the experimental study of vital processes.

THE SUBJECT-MATTER OF ANTHROPOLOGY.

The Scope and Content of the Science of Anthropology.

By Juul Dieserud. Pp. 200. (Chicago: The Open Court Publishing Co.; London: Kegan Paul, Trench, Trübner and Co., Ltd., 1908.) Price 8s. 6d. net.

A PERUSAL of this book will convince most people that the terminology and classification of the subject-matter of anthropology is at present in a state of almost hopeless confusion. In England, early authorities like Hunt defined anthropology as the science of the whole nature of man, including the study of his anatomical, physiological and psychological characters, and this logical view has fortunately been maintained among the majority of anthropologists in this country up to the present day. In France also the original view, as expressed by Pruner Bey, was that anthropology embraces the study of man in time and space, and the great Broca took a very similar view of the scope of the science. In Germany, however, a beginning of the descent from this clear and reasonable definition of the science appears to have been made in 1879 by Müller, who divided anthropology into (1) physical anthropology and (2) psychic anthropology, and this cleavage was made wider by Grosse, who in 1894 completely separated the second of Müller's subdivisions from anthropology and gave it a new designation, namely, ethnology, or the culture of races.

Ethnology and its related term ethnography were henceforth widely applied, chiefly in Germany and America, to a new science dealing with the culture of races. It was excluded from the science of anthropology, chiefly, no doubt, because this study had increased more rapidly than other departments of anthropology, its material data being represented by large collections of tools, weapons, dress and pottery in museums, and its psychic data by numerous memoirs on manners and customs, religion and folklore. From a logical point of view it is difficult to see why the study of the psychological evolution of man, as expressed by the various products of his activity, should be excluded from anthropology—the science of the whole nature of man—and it is still more difficult to see why the term ethnology, which etymologically means the science of peoples or races, should be applied to this new science, for which the proper designation would appear to be that given to it by Achelis, namely, psychical anthropology.

This confusion in the terminology of anthropology is, however, now so widespread that it will take a long time to set it right, and Mr. Dieserud's book will, we fear, only tend to perpetuate the confusion. He shows himself throughout strongly in favour of the misuse of the term ethnology by excluding from its scope all somatic or physical anthropology, though

he very illogically compromises between reason and use, or rather abuse, by admitting physical subject-matter under the allied term ethnography.

The second part of Mr. Dieserud's book consists of a scheme of library classification for works on anthropology. He divides the subject into three main classes, namely, (1) general, (2) somatology or physical anthropology, and (3) ethnical anthropology. The second and third classes are further subdivided, and a comparison of some of these subdivisions will give some idea of the consequences of the irrational classification of anthropology which the author has adopted. For example, under class (2) we have a subdivision "racial psychology," and under class (3) a subdivision "ethnical or folk-psychology." The plain man will find it very difficult from the names to discover any difference between the two subclasses. There appears to be a great amount of apparent overlapping in other subclasses; for example, it is difficult to distinguish between palæoanthropology and palæo-ethnology or archæology, and yet these are separate and distinct subdivisions.

In the details of the physical anthropology section of his classification, the author evidently owes a great deal to the excellent scheme of Prof. Martin, of Zürich, and where he departs from this it is not often by way of improvement.

The subdivision of his third class, "ethnical anthropology (or psycho-socio-cultural anthropology)," is very minute, but apparently here also we have redundancy; for example, "gambling and its implements" and "gambling implements" are two different subdivisions, one of which appears to be unnecessary.

Part iii. of this work consists of a bibliography containing a list of a few important works on anthropology, with notes of their contents, and a list of the chief publications of leading anthropological societies and museums.

Though we cannot recommend Mr. Dieserud's scheme of classification either to librarians or anthropologists, his book is well worth reading, and contains much material that is of great value to the anthropologist who is interested in the question of the scope and content of his science. J. G.

REFRIGERATION.

The Mechanical Production of Cold. By J. A. Ewing. Pp. x+204; illustrated. (Cambridge: University Press, 1908.) Price 10s.

LOW temperatures are rapidly becoming of great industrial and scientific importance, so that the general principles of their application are necessary or useful to continually increasing numbers of people. In this book Prof. Ewing has brought the Howard lectures, which he gave to the Society of Arts in 1897, up to date in various directions by the addition of sections on the more important developments in the last ten years. In these attention is paid to such questions as the production of oxygen by the rectification of liquid air and the theoretical investigations

which lead to the calculation of the efficiency of refrigerating engines.

Starting with the conception of a refrigerating engine as a heat pump which requires the expenditure of mechanical energy to bring heat from a lower to a higher level of temperature working on a reversed Carnot's cycle, the significance of indicator and entropy diagrams is explained in non-mathematical language. The thermodynamical details are worked out more completely in various appendices. These include discussions of entropy (ϕ) diagrams, with either temperature or thermodynamic potential (i) as the other coordinate. A reproduction on a large scale of Dr. R. Mollier's ϕ - i diagram for carbon dioxide is given at the end of the book, and its usefulness in tracing the exact behaviour of an engine using this as working substance is shown. There are also tables of the properties of ammonia, sulphur dioxide, carbon dioxide, and water vapour which would be necessary in such calculations. All these data are given in C.G.S. units, and it is to be regretted that these have not been used throughout the book so as to make it more uniform, and also because there is a strong opinion now that either C.G.S. or some derived units founded on them would be used internationally in applied thermodynamics with the same advantage as they have been in applied electricity.

Absorption and air-compression machines are now only employed in special cases, but they are interesting, and are considered in the second and third chapters.

At the present time, nearly all new installations use the vapour-compression system to which the fourth chapter is devoted. The substances which are used are water vapour, which is clearly only applicable in very special cases, carbon dioxide, sulphur dioxide, ammonia, and methyl chloride. Each of these has special applications, determined by size or danger of explosion, or the unwholesome nature of the gas, in addition to their efficiencies as working substances. It is shown that the theoretical efficiencies increase in the order given with the exception of the last, which is only just mentioned, although it is employed in well-known cascade installations, and is coming into use largely as a convenient substance for small portable machines on rail-road cars and similar places. This chapter, in connection with the following sections devoted to the testing of refrigerating machines, especially by the Munich method, should be of considerable use to students and other workers in this field. Short accounts follow of the principal applications of moderate cold in industries such as brewing and others depending on fermentation processes, also in ice-making, and in the preservation and transport of food and other perishable articles. A section is devoted to the cooling of magazines in ships of war, about which the author writes with special authority.

The remainder of the book discusses the production and application of very low temperatures, such as those obtained by liquid air, liquid hydrogen, and now quite recently by liquid helium. There are three principal methods of reaching these low temperatures, which are all described: the cascade of Cailletet and Pictet, the expansion method of Siemens and others,

and the combination of the cooling due to throttling and the regenerative principle by Linde. The main industrial application is for the production of oxygen from liquid air, which is obtained by the Linde process or by the modification of this introduced by Claude, in which the Siemens principle is combined with it. There are considered in detail, and it is shown how the rectification is carried out so that nearly pure nitrogen, as well as nearly pure oxygen, is obtained by the same process. Dewar's work on hydrogen follows, with a *résumé* of its properties and a mention of those of liquid helium.

The book is well illustrated with diagrams and drawings, and has a good index. F. H.

OUR BOOK SHELF.

Principles and Methods of Physical Education and Hygiene. By W. P. Welpton. Pp. xix+401. (Cambridge: University Tutorial Press, Ltd., 1908.) Price 4s. 6d.

THIS book is addressed to the teachers of elementary schools, and to such of them as enjoy the study of physiology much pleasure will be derived from the perusal of every chapter. The author, we see, is master of method in the University of Leeds; he describes methods as well as theory of cleanliness, ventilation, care of the eye, and such "first aid" as is likely to be called for. More theory than method, however, is set down to advance the practising of the physical exercise part of physical education. We have no idea how the author would arrange to get the best use out of the school playground; how he would attain some organisation of games among scholars without encroaching upon the teacher's time.

"Glycogen" is referred to seven times in the index, but one can find no list of games or activities that suit the different periods of school life, such as would be helpful to the organiser of physical education; accordingly one regrets that theory dominates this work. We are apt to forget that our professional trainers of athletes have been very successful in their way, and with them athletics called the trainers into being; a development of play is the first step towards bettering physical education.

Everyone interested either in games or physical education in its fuller aspect will be delighted with the chapter on the history of physical education, contributed by Prof. J. Welton, with quotations such as that from Lucian on the Athenian boy. "When he has laboured diligently at intellectual studies and his mind is sated with the benefits of the school curriculum, he exercises his body in liberal pursuits, riding or hurling the javelin or spear. Then the wrestling school with its sleek oiled pupils labours under the midday sun, and sweats in the regular athletic contests. Then a bath, not too prolonged; then a meal, not too large, in view of afternoon school. For the schoolmasters are waiting for him again, and the books which openly or by allegory teach him who was a great hero, who was a lover of justice and purity. With the contemplation of such virtues he waters the garden of his young soul. When evening sets a limit to his work, he pays the necessary tribute to his stomach and retires to rest to sleep sweetly after his busy day." Education in this breadth and spirit, lost in the dark ages—for the exercises of chivalry do not represent it—was revived in Italy at the Renaissance, and the first English exponents of this revival—Mulcaster, 1581, and Sir Thos. Elyot, 1531—had their influence dominated by the Puritanism